GCSE MARKING SCHEME

SUMMER 2022

GCSE
BIOLOGY - UNIT 2
3400U20-1 AND 3400UB0-1

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INTRODUCTION

This marking scheme was used by WJEC for the 2022 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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WJEC GCSE BIOLOGY – UNIT 2

SUMMER 2022 MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied). Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer. Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

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Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Random (1) Radiation (1) Increase (1)	3			3		
	(b)	(i)		25 (%) = 2 marks If incorrect award 1 mark for: $\frac{4}{16}$ (x 100) 1/4		2		2	*2*	
		(ii)		3 males: 1 female		1		1		
		(iii)		• More males than female with CF/ ORA if context clear there is a 3:1 ratio (of males to females) / the ratio is different (1) • {More people /higher %} with CF/ 25% (of the family) have CF/ the percentage is different (1)			2	2		
	(c)	(i)		Gene therapy	1			1		
		(ii)		Inhalation	1			1		
				Total for question 1	**5**	**3**	**2**	**10**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)	(i)		Thick fur Ignore reference to long tail/ hibernation		1				
		(ii)		{Grasping/ gripping/ holding} {feet /claws} Ignore reference to trees		1				
		(iii)		{Large/ big} eyes		1				
	(b)			**Any one (x1) from** • hibernation / not active in winter Ignore sleep through winter/ nests at ground level • nocturnal / active at night/ • lives (high) up in {trees/ bushes}/ live in trees away from predators Ignore live in trees		1				
	(c)			(true) given False False True True True five correct – 4 marks four correct – 3 marks three correct – 2 marks two correct – 1 mark	2	2			1	
				Total for question 2	**2**	**6**	**0**	**8**	**1**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Brain (1) Spinal cord (1) **In either order**	2			2		
	(b)	(i)		A: Cornea (1) B: Blind spot (1)	2			2		
		(ii)		Lens (1) Choroid (1) Optic nerve (1)	3			3		
		(iii)		• {Iris (muscles)/ part C} contract (1) • (Make){pupil/ part D} {smaller/ constricts/ decreases in size} (1) • {Reduce/ less/ limit} light entering eye (1) Reject stop light entering eye		3		3		
				Total for question 3	**7**	**3**	**0**	**10**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Transplant • {Better/ very high/ 97%} chances of survival (for 5 years) • {Less time in/fewer visits to} hospital/ only one visit to hospital • May {eat /drink} normally • {No/ little} loss of {employment /sport}/ still do their job Dialysis • {No /less/ short} waiting / treated quickly • No (anti-rejection) drugs • Less invasive procedure (or eq wording)/ not major surgery Donors • Relevant suggestion related to opting {in/ out} /education/raising awareness/ adverts • Needed to reduce the waiting times for a transplant. / reduce the shortage of donors. **5-6 marks (7 or more points of indicative content)** *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks (4-6 points of indicative content)** *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.*		4	2	6		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
				1-2 marks (1-3 points of indicative content) *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure*. *The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*						
	(b)			Types must {match/ be same / {similar/ compatible} (1) To {avoid /reduce /minimise} rejection (1) Different tissue types can cause rejection= 2 marks	2					
				Total for question 4	**2**	**4**	**2**	**8**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Insulin (1) Pancreas (1) Glucose/ sugar (1)	3			3		
	(b)	(i)		Scale correct (1) all bars correct 2 marks 1 error 1 mark >1 error 0 marks with labels (1) ecf for bars if scale incorrect		1 2 1		4	4	4
		(ii)		• Number of volunteers who had {high blood pressure /obesity} was lower in coffee drinkers/ ORA (1) • No effect on diabetes (1)			2	2		2
		(iii)		**Any one (x1) from** • Should have chosen the same {age/ gender/ height/ weight/ BMI/ activity} of volunteers • Should have made sure that volunteers had same {volume/concentration/ mass/ brand/ number of cups} coffee			1	1		1
		(iv)		The investigation was done by a company selling coffee/conflict of interest or eq. wording.			1	1		1
	(c)			Relevant ref to low {carbohydrate/ named carbohydrate/fat/ calorie} diet / regular exercise	1			1		
				Total for question 5	**4**	**4**	**4**	**12**	**4**	**8**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			Invertebrates	1			1		
	(b)	(i)		Risk: falling on uneven ground and cutting skin when {walking over rocks/ placing quadrat} **and** Control measure: suitable footwear		1		1		1
		(ii)		**Any three (x1) from** Lay out tapes/ lay out grid (1) (Random) numbers generator /dice (to identify co-ordinates)/ choose random co-ordinates/ or description of (1) Place quadrat and count (1) Ref to whether to {count/ include} limpets on edge of quadrat (1)	3			3		3
		(iii)	I	Mean = 26.1 (accept 26 as nearest whole number)		1		1	1	1
			II	Total for area = 7830 = 2 marks If used 26 allow 7800 = 2 marks If incorrect award 1 mark for 26.1 or 26 × 300 Allow ECF from I		2		2	2	2
		(iv)	I	More (limpets) on sheltered shore (ORA) (1)			1	1		1
			II	More food / less waves / less wind/ less likely to be washed away/ ORA (1)			1	1		1

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(v)		(Quadrat) 5 (1) Result should not be included (in the calculation of the mean) (1) Ignore repeating reading			2	2		1
				Total for question 6	**4**	**4**	**4**	**12**	**3**	**10**

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Question 7				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7/1	(a)	(i)		**Any two (×1) from:** • Specific/ only targets pest/ does not kill {other organisms/ insects/ non-target organisms} (1) • No {pollution/ damage to environment/ poisoning/ use of chemicals/ use of pesticides/ bioaccumulation} (1) • No resistance (1) • Only needs to be introduced once/ long term method (1) • Once set up, low cost (1)	2			2		
		(ii)		**Any two (×1) from:** • Initial cost to research (1) • Pests not completely eradicated (1) • Introduced species could become a pest itself / disrupts food chain/ outcompete other species (1) • Takes time to work (1) • Introducing disease (1)	2			2		
	(b)	(i)	I	31 or 31.5 or 32 days = 2 marks If incorrect award 1 mark for 38 or 38.5 or 39 days (not subtracting the initial 7 days)		2		2	2	
			II	(May take a while for whitefly to die as) the wasp eggs need time to hatch/ took time for the wasps to {reproduce/ start killing}/ takes time to lay the eggs Ignore ref to temperature			1	1		

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Question 7				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**Any one (×1) from:** Low temperatures/ temperature less than {17/20°C}/ {it/ Wales/ weather} is too cold (1) *E.formosa* not contained in greenhouse/ *E.formosa* can fly away (1)			1	1		
		(iii)		Will {kill/ destroy} {*E.formosa* / wasp} Reject ref to other organisms	1			1		
				Total mark for question 7/1	**5**	**2**	**2**	**9**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8/2	(a)	(i)		{(Alternative) form/ version/ variation/ type} of {a gene/ section of DNA/ the same gene} Reject different types of {genes/ gene}	1			1		
		(ii)		**Any one (x1) from** • Allele that is always {expressed/ shown} in the phenotype (if it is present) (1) • allele {expressed/ shown} in heterozygous condition/ allele {expressed/ shown} if present (1) Only one allele is needed in the genotype to be {expressed/ shown} (1) Reject reference to gene	1			1		
		(iii)		**Any one (x1) from** Allele that is only {expressed/ shown} in the absence of a dominant allele/ ORA (1) Only expressed when homozygous (1) Needs two in the genotype to be expressed (1)	1			1		
	(b)	(i)		Correct gametes HH X hh (1) Mechanics = Hh (1) If gametes incorrect 0 marks. Allow 1 ECF mark for correct genotypes If incorrect letters used 0 marks for gametes 1 ECF mark for genotypes. If X, Y used 0 marks for Punnett square		2		2		*2*
		(ii)		Short (-haired) ecf from (i)		1		1		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		Correct genotypes Hh X Hh (1) Correct offspring HH, Hh, Hh, hh (1) Ecf from (i)		2		2		2
		(iv)		6 (ecf from iii)		1		1		
		(v)	I	short (haired) (1)			1	1		1
			II	some kittens long haired, some short haired (1)			1	1		1
				Total mark for question 8/2	**3**	**6**	**2**	**11**	**0**	**6**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Differences (between individuals) (1) Of {the same/ a} species (1)	2			2		
		(ii)		Continuous		1		1		
	(b)	(i)		0.40:1 = 2 marks Award 1 mark for 0.396 0.4 3.96/10		2		2	2	2
		(ii)		• {Height: width ratio/ it} is greater for limpets on the upper shore/ limpets on upper shore are taller and narrower/ ORA (1) • because do not need to grip as much/ because there are less waves/ ORA (1)			2	2		2
		(iii)		Measure more shells / use more sites/ larger sample size/ ref to reproducibility Ignore repeating investigation unqualified			1	1		1
				Total mark for question 3	**2**	**3**	**3**	**8**	**2**	**5**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		**A**. sensory neurone (1) **B**. motor neurone (1) **C**. synapse (1) **D**. {relay/ connecting} neurone (1)	4			4		
		(ii)		**Any two for 1 mark** Fast Automatic/ involuntary (Some are) protective	1			1		
		(iii)		Award 2 marks for 0.012/ 0.01 If incorrect award 1 mark for $\frac{0.9}{75}$		2		2	2	
	(b)			• Impulses cannot {stimulate/ reach} {effector/ muscle}/ Harder for (electrical) impulses to get to {effector/ muscle}/ impulses take longer to reach {effector/ muscle} (1) • to contract (1)			2	2		
				Total mark for question 4	**5**	**2**	**2**	**9**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		A {non-native organism / owtte} introduced into a {habitat/country} and {which causes harm/ or description of} OR Alien species which causes {harm/ or description of}	1			1		
		(ii)		*Anoplolepis* Reject full name	1			1		
		(iii)		Decrease biodiversity **and** {as species will be killed/ loss of species} (1) OR Increase biodiversity **and** as there will be large numbers within the super-colonies (1)			1	1		
	(b)	(i)		4	1			1		
		(ii)		17 (1) chromosome number is the number in the gamete/ the {gamete/ egg} has half the number of chromosomes of the parent cell/ body cells/ owtte (1)			2	2		
		(iii)		Replacing cells/ repairing tissue/ repair Reject repair of cells/ growth		1		1		
				Total mark for question 5	**3**	**1**	**3**	**7**	**0**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		one {cell/ bacteria} forms one colony Accept there is no clumping/ or description of	1			1		1
		(ii)	I	3.1×10^5 = 3 marks Award 2 marks for 310000 Award 1 mark for 31 colonies Error in counting – 30 or 32 Award 2 marks for 3.2×10^5 3×10^5 Award 1 mark 320000 or 300000		3		3	3	3
			II	Correct conclusion based on answer calculated in I. Eg. No, it was not safe as the number of bacteria was above the {safe limit/ 1 x 10^5}			1	1		1
	(b)			To test for the presence of human pathogens/ OWTTE Ignore reference to temperature of body			1	1		1
	(c)	(i)		To prevent {contamination/ or description of} of {environment/ agar plates}	1			1		1

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**Any two (×1) from:** • Work {in updraft/ close to} of Bunsen burner (1) • Sterilise {nutrient agar / petri dishes} (1) • {Disinfect/ sterilise} work area (1) • Sterile {equipment/ spreader/ loop/ flame mouth of test tube} (1) • Only open petri dish slightly (1)		2		2		2
				Total mark for question 6	**2**	**5**	**2**	**9**	**3**	**9**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			Position of X in cortex	1			1		1
	(b)			• X = Bowman's capsule • Y = Collecting duct • Ultrafiltration • Ref to differing diameters (of blood vessel) causing pressure • Small molecules / {water/ salts/ urea/ glucose} • forced {into {Bowman's capsule/ X}/ from {capillary knot / glomerulus} • Some {water/ salts} (selectively reabsorbed) (as filtrate passed down tubule) • All glucose is (selectively reabsorbed as filtrate passed down tubule) • At Y filtrate contains urea +(excess) salt +(excess) water **5-6 marks** At least seven points from the indicative content *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3-4 marks** At least four points from the indicative content *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1-2 marks** At least one point from the indicative content *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*	4	2		6		

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			Protein (molecules) too large (1) to {be filtered/ pass through capillary wall/ fit through holes/ fit through semi-permeable membranes} (1)		2		2		
				Total mark for question 7	**5**	**4**	**0**	**9**	**0**	**1**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			A change in {a gene/ DNA/ a chromosome/ genetic material/ base sequence/ genetic code} Reject change in genetics	1			1		
	(b)	(i)		870 = 2 marks If incorrect award one mark for 30% of 2900		2		2	2	
		(ii)		{3 bases/ triplet/ codon} (1) codes for one amino acid (1) Amino acids {link/join/ or description of} together to form HER2 protein (1)	2	1		3		
	(c)			• (Monoclonal antibodies) {are specific/ complementary shape/ match} to {HER2/ the} {protein/ antigen} (1) • {Bind/ join} to (surface) {protein/ antigen} (1) • drug enters cancerous cells (so it destroys the cells from within) (1)		3		3		
	(d)			**Any two (×1) from:** • Diagnostic tests/ example: chlamydia/HIV/ pregnancy test/ {identify/ diagnose} {disease/ named disease} (1) • Tissue typing (for transplants) (1) • Monitoring (the spread of) malaria (1)	2			2		
				Total mark for question 8	**5**	**6**	**0**	**11**	**2**	**0**

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		Sweat gland labelled and named (1)	1			1		
		(ii)		{Blood vessel/ (blood) capillary} labelled and named (1)	1			1		
	(b)			**Any five (×1) from:** A. Lag time/ or description of (1) B. (Drinking ice-cold water causes) a decrease in (internal) body temperature (1) C. (This leads to a) decrease in sweat production (1) D. (Less sweating means) less heat lost from the skin <u>surface</u> (1) E. Due to less evaporation of sweat (1) F. Skin temperature increased (1)		3	2	5		5
				Total mark for question 9	**2**	**3**	**2**	**7**	**0**	**5**

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FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	3	2	10	2	0
2	2	6	0	8	1	0
3	7	3	0	10	0	0
4	2	4	2	8	0	6
5	4	4	4	12	4	8
6	4	4	4	12	3	10
7	5	2	2	9	2	0
8	3	6	2	11	0	6
TOTAL	**32**	**32**	**16**	**80**	**12**	**30**

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HIGHER TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	5	2	2	9	2	0
2	3	6	2	11	0	6
3	2	3	3	8	2	5
4	5	2	2	9	2	0
5	3	1	3	7	0	0
6	2	5	2	9	3	9
7	5	4	0	9	0	1
8	5	6	0	11	2	0
9	2	3	2	7	0	5
TOTAL	**32**	**32**	**16**	**80**	**11**	**26**

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